Sodium carboxymethylcellulose (SCMC) is widely used in the design of wound dressing owing to its high water bonding capacity, good compatibility with skin and mucous membrane, biocompatibility and abundant availability at a low cost. This study aims to design drug-free (low (LV), medium (MV) and high molecular weight (HV)) SCMC scaffolds and promote their ability to promote partial thickness burn wound healing via wound moist regulation and microbial burden control. In addition, SCMC scaffolds of distinct wound healing ability is incorporated with γ-tocotrienol as antioxidant therapeutic and has its wound healing property assessed against pure tocopherol and tocotrienol. SCMC scaffolds were prepared by means of solvent evaporation technique and their physicochemical properties namely, in vitro erosion, moisture affinity, morphology, tensile strength, polymer molecular weight and carboxymethyl substitution were investigated against partial thickness burn wound. The transepidermal water loss (TEWL) from wound of rats treated by control > HV scaffold > LV – MV scaffold. HV scaffold possessed the highest tensile strength of all matrices and was resistant to erosion in simulated wound fluid. In spite of constituting small nanopores, it afforded a substantial TEWL than MV and LV scaffolds from wound across an intact matrix through its low

Pectin has received a widespread application in oral drug delivery system design due to its biodegradability, biocompatibility and non-toxicity. This study aims to formulate sustained-release pectinate beads with diclofenac sodium as small molecule drug model by means of microwave technology and pectinate nanoparticles with insulin as macromolecular drug. The pectinate beads were prepared by an extrusion method with chitosan loading internally in the pectinate beads or externally via coacervation. These beads were treated by microwave at 80 W for 5, 10, 21 and 40 min, and had their drug release examined against physicochemical changes of matrices. Treatment of pectinate beads by microwave did not lead to a decrease, but an increase in the extent of drug released at 4 h of dissolution. The drug release of pectinate beads was reduced only upon core loading of chitosan on treating the externally coacervated pectinate–chitosonium beads with microwave. The treatment of chitosan–pectinate matrix by microwave brought about an increase in the extent of drug released unlike those of pectinate–chitosonium beads. Apparently, the loading of chitosan into the interior of pectinate matrix could effectively

The influence of novel triacylglycerols (TAGs) on the topical delivery of α-tocopherol and their role as emollients was investigated. For topical application, TAGs as enhancers were developed to improve the delivery of actives across the skin as the skin barrier limited their use. Medium chain triacylglycerols (MCTs) have previously been used as carriers and enhancers for fat soluble vitamins and other actives as they work efficiently in delivering the active through the skin by modifying properties of the stratum corneum (SC) barrier. However, little published data are available concerning the permeation and effects of MCTs following topical application. The first part of the study was aimed to: i) develop and validate an assay method for determining α-tocopherol in methanolic solution and rat skin extract; ii) develop and validate an assay method for determining fatty acids methyl esters using gas chromatography; and iii) validate the automated diffusion equipment for in vitro experiment. The second part of the study was to produce novel TAGs namely structured virgin coconut oil (SVCO), by lipase catalysed acidolysis of caprylic acid and the virgin coconut oil (VCO). The percentage of caprylic acid finally incorporated
moisture affinity characteristics. HV scaffold was also found to protect moisture loss with minimal accumulation at wound bed thus promoted reepithelialisation process. Transepidermal water movement wound healing by scaffolds was governed by SCMC molecular weight instead of its carboxymethyl substitution degree or matrix pore size distribution. In infected partial thickness wound, in vitro polymer characteristics, microstructure, gelling, bioadhesiveness, microbial inhibitory, in vivo microbe-colonized wound healing, microbe removal and infection control properties were examined against Gram positive Staphylococcus aureus and Gram negative Pseudomonas aeruginosa. P. aeruginosa was removed via gelling action of LV scaffold which encapsulated microbes possibly with the binding aid of their extracellular by-product. S. aureus was removed via HV scaffolds ability to crease into multiple tight folds to accommodate the microbes under compression and retarded its growth. SCMC scaffolds promoted healing via physical attachment and retard the drug release without subjecting the beads to the treatment of microwave. The microwave was merely essential to reduce the release of drug from pectinate beads when the chitosan was introduced to the pectinate matrix by means of coacervation. The calcium pectinate-insulin nanoparticles were prepared by ionotropic gelation method, with alginate, sodium chloride or Tween 80 as additive. Their in vitro physicochemical, drug release and in vivo glucose lowering characteristics were evaluated. Spherical calcium pectinate-insulin nanoparticles were characterized by size, zeta potential, insulin content and insulin association efficiency of 348.4 ± 12.9 nm, −17.9 ± 0.8 mV, 8.4 ± 1.0% and 63.8 ± 7.4%, respectively. They released less than 25% insulin following 24 h in simulated intestinal medium and exhibited delayed blood glucose lowering effect in rats. Incorporation of solubilizer sodium chloride or Tween 80 into nanoparticles in the reaction products was optimized using the central composite design (CCD). It was suggested that the highest incorporation of caprylic acid (68.07%) would be achieved by: caprylic acid to VCO ratio of 1.70 (w/w); an enzyme load of 22.60%; at 63.4°C; a water content of 3.53%; and at 96 h. Using the predicted optimum conditions, pentaplicate experiments gave a good result (64.11 ± 1.14%) that coincided with the predicted value and the model was deemed to be adequate. The third part of the study looked at the effect of permeation enhancer formulations on the permeation of α-tocopherol, a model permeant, in vitro and in vivo. Both approaches revealed that SVCO was a significantly better permeation enhancer than VCO. This probably indicated that the shorter carbon chain SVCO might be a better permeation enhancer. The final part of the study investigated the emollient properties of the newly develop enhancers. These were determined using instrumental measurement and sensorial perspective by trained panels. Skin biophysical studies on various skin parameters such as moisture and transepidermal water loss (TEWL) contents, skin firmness and elasticity and surface evaluation on the living skin (SELS) from topical application to human healthy volunteers showed statistically significantly improved effects by both SVCO creams and VCO creams compared to the skin before creams application. In conclusion, novel permeation enhancers were successfully developed by acidolysis of VCO and caprylic acid. The SVCO was found to exert better skin permeation enhancing effect on α-tocopherol than VCO. Both VCO and SVCO gave emolliency effect when applied topically.