

Polymer-masking-UnMasking-Protein Therapy was used to generate bioresponsive polymer therapeutics for tissue repair. Dextrin-recombinant human epidermal growth factor conjugate was composed of 16% wt recombinant human epidermal growth factor with less than 1% free protein. The conjugate was stable in proteolytic degradation environment and the dextrin was degraded under the addition of  $\alpha$ -amylase resulting in the sustained 52.7% release of free recombinant human epidermal growth factor for 168 h. In vitro studies using epidermoid carcinoma cells and HaCaT keratinocytes revealed that the conjugation of recombinant human epidermal growth factor to the polymer reduced its bioactivity. However, in a physiological environment of  $\alpha$ -amylase, the degradation of dextrin resulted in protein unmasking with a restoration of bioactivity of the recombinant human epidermal growth factor. A prolonged proliferation of HEp2 proliferation was significant for 8 days. The conjugate-induced phosphorylation of the epidermal growth factor receptor in HEp2 cells  $\alpha$ -amylase physiological environment [136].

#### 4. CONCLUSION

The therapeutic outcomes of loading antibiotics into polymer-based wound dressings have been reported by several researchers. Hydrogels were reported to be nonthrombogenic, good antioxidant with a mucoadhesive activity which is influenced by the nature of the polymers used for the preparation of the hydrogels. Most of the hydrogels are developed from a combination of natural and synthetic polymers. The hydrogels are designed with good permeability to oxygen and moisture and nonpermeability to microorganisms. In vivo studies of most of the hydrogels further revealed a good formation of fibroblasts and blood capillaries with the absence of inflammation. The surface roughness of hydrogels influenced their mucoadhesive nature. High hydrophilic nature of some of the synthesized hydrogels contributed to low hemolytic capability suggesting a low interaction of the hydrogel network with the red blood cell resulting in reduced disruption of the red blood cell. The drug release mechanisms of the drug-loaded hydrogels were controlled and sustained. Loading antibiotics into the hydrogels resulted in their capability to inhibit bacterial proliferation in vitro and did not interfere with the healing process. Most of the hydrogels were nontoxic. Furthermore some of them induced skin regeneration in vivo which revealed their potential application for tissue regeneration.

Hydrocolloids capability to retain fluid makes them suitable for providing a moist environment for wounds. They were reported to accelerate epithelialization thereby speeding up the wound-healing process. The moist environment around a wound makes the wound soft and induces the migration of fibroblasts and keratinocytes, cell growth factors and cytokines thereby accelerating epithelialization and wound healing. Hydrocolloid dressings used in patients with earlobe keloid patients who had surgical excision resulted in good postoperative outcomes. Incorporation of activated carbon enhanced the bacteriostatic or antimicrobial activity of the hydrocolloids and also prevented unpleasant smell which is a limitation associated with the use of hydrocolloids. A regenerated dermis layer indicating accelerated wound healing was also reported on hydrocolloids used in wound dressings. Despite the good therapeutic outcomes of hydrocolloids, there is still a pressing need to develop hydrocolloids that can prevent unpleasant smell which is usually confused with infections.

Foams good antibacterial activity and noncytotoxic in vitro have been reported. Their capability to promote a scar-free wound healing characterized by accelerated re-epithelialization and collagen deposition in the excision wound model in vivo reveals the potential of foams in wound dressing. However, the number of research reports on foams loaded with antibiotics is few. Commercially available foams are affordable, do not require frequent changes and promote autolytic debridement and accelerate wound healing.

Films application in wound dressings has also been reported. Their capability to detach itself from a wound site when swiped with water at a temperature lower than body temperature has further indicated the efficacy of films. They can be stretched to over 100% their original length and their nonporous nature contribute to their waterproof barrier. However, drug loading of nitrofurazone into films in some cases resulted in reduced tensile strength, swelling ability, oxygen permeability.

Nanofibers and membranes loaded with antibiotics were also reported to promote skin regeneration, accelerate wound healing and protect the wound from bacterial infections. However, the development of polymer-drug conjugates as wound dressings is still at the infancy stage which indicates there is still a need for more information on the mode of action of polymer-drug conjugates on wound healing. Several reports by researchers reveal that polymer-based wound dressings offer unique features suitable for the treatment of acute and chronic wounds. However, there is a pressing need for some of the wound