

THE NOVELTIES ABOUT POLYMER MATERIALS USE FOR BURN TREATMENT JAUNĀKĀS ATZIŅAS PAR POLIMĒRU MATERIĀLU IZMANTOŠANU APDEGUMU ĀRSTĒŠANĀ

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Kopsavilkums

Analizēta jaunākā informācija literatūrā par polimēru materiālu izmantošanu apdegumu ārstēšanā, novērtētas materiāliem piemītošās un nepieciešamās īpašības to veiksmīgai pielietošanai. Apskatīti mūsdienīgi apdegumu ārstēšanā izmantotie polimērmateriāli un to sistēmas, kā arī izvērtēta šo sistēmu un to atsevišķo sastāvdaļu ietekme uz būtiskākajiem brūču dzīšanu veicinošajiem raksturojumiem.

To develop new burn dressing the most important is to specify properties that burn dressing must possess. The first important precondition for burn dressing use is necessity to moisture the wound surface. In this case the most suitable are hydrophilic substances.

All dressings need to be permeable to moisture. It is necessary for prevention of accumulation of body fluid. The permeability have not to be too low or too high and can be controlled by porosity of dressing; the optimal pore diameter is found to be 10 μ .

It is considered that migration of cells from the wound edges appears to be function of two parameters: the pore size and thickness of the dressing. [1] When dressing is too thick, then can be problems with dressing adhesion to the wound, at the same time the cell migration is hindered, on the other hand when a dressing is too thin it could be easily damaged.

Therefore the dressing mechanical parameters need to be considered.

It is very important to find materials which can fulfill all these requirements.

All wound dressings can be divided in two large groups: non-biodegradable and biodegradable dressings. The non-biodegradable wound dressings can be: the first - impervious to cell ingrowths and the secondly - containing an open mesh or pore like structure that allows cellular integration. These wound dressings could be used only as a temporary cover for the wound and should be removed. An alternative possibility is to use biodegradable wound dressings breaking down after some time, leaving the newly formed tissue. In case, when biodegradable wound dressings are used the degradation rate of the burn dressing can be controlled by changing polymer crystallinity, chemical composition and molecular weight. [1, 2]

The first group suitable for burn dressing development includes macromolecular-based compounds such as polypeptide polymers and certain polysaccharide compounds, for example, with starch. These polymers can be degraded by enzymes to non-toxic compounds. Hydrated forms of those polymers can provide adequate wetting of the wound surface. The second suitable class includes synthetic compounds. For example, poly (dimethyl siloxane), polyamides, saturated polyesters, but they are not hydrophilic or biodegradable. These synthetic compounds can be used only for temporary wound coverage. However it is possible to use compounds which degrade and at the same time wet the wound. One of them is poly-*n*-butyl- α -cyanoacrylate, but it forms toxic by-products, when it is broken down. The most popular are collagen and glycosaminoglycan, chondroitin 6-phosphate, do to their important properties: low antigenicity, nontoxic break down products, etc. [1]

One of the recently used burn dressing materials are hydrogels. Hydrogels are networks of macromolecules stabilized either by chemical or physical crosslinks. [3] In general, hydrogels can be used as drug carriers; the drug may be contained within the polymer network structure of the gel and may be released out of the gel over time. As the gel network swells, the linear distance between crosslinks increases, allowing the drug to diffuse out of the gel. For example, polyvinyl (alcohol) (PVA) hydrogel has a number of desirable characteristics that make it as a good burn dressing material. It has sufficient mechanical strength and high elasticity and it swells being in contact with water. [4] Another hydrogel which can be used for burn dressing is poly (ethylene glycol) (PEG). PEG is nontoxic, biocompatible and hydrophilic material. PEG hydrogels that can swell extensively but not dissolve. PEG has good mechanical properties and high levels of hydration, therefore it is very good material for dressing preparation.

To achieve the better dressing material properties, copolymers can be used. For example, PEG incorporated with poly (α hydroxyl acids) such as polylactic acid (PLA) and polyglycolic acid (PGA). [5]

Now day's porous materials play an important role for burn dressing development, especially of polymeric foams and sponges. Collagen-based structures, PLA, PGA, poly (lactic-co-glycolic) acid (PLGA) and polyester-based polyurethanes generally are the preferred materials for porous burn dressing development. The use of porous materials can be appropriated for achieving the necessary fluid permeability and cell migration.

The newest scientifically developed materials are dressings where polymers are composed with epidermal cells taken from a patient and polymers with silver ions.

Not only materials can influence burns treatment, but also there is the important role of medicine. The newest idea is to use vulnerary plants such as aloe, propolis, marigold etc. in burn dressings.

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