



OVER REVIEW ON POTENTIAL USE OF HYDROGEL IN CANCER TREATMENT

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ABSTRACT

In this review study was carried out to focus on uses of hydrogels in cancer treatment. hydrogel has unique property due to which it has played a vital role in controlled-release drug delivery systems. A hydrogel has property of swelling in water and 3-D structure. In this review we have focuses on use of hydrogel specifically in breast cancer, metastatic cancer, use of hydrogel in Transdermal drug delivery. hydrogels facilitate the modern and improved prospects for the treatment of cancer with minimum cytotoxic effects to the healthier cells or tissues. in the text we have overviewed about types and methods of hydrogel preparation. we have conclude with the help of hydrogel we can increase the potentiality and patient compliance in treatment of cancer ,also it possible to come over few side effects.

Key words: hydrogel, types, cancer therapy.

INTRODUCTION

Hydrogels have three-dimensional networks structure of chemically or physically cross-linked polymers which has the swelling ability in the water. Due to its unique physicochemical properties, hydrogels have emerged as a safe and effective depot-based drug delivery system in cancer therapy. In this review, we focus on hydrogels for cancer treatment. As hydrogel has unique character which plays important role cancer therapy and therefore gives potential applications of hydrogels in cancer therapy.[1,2] synthetic hydrogels has the ability of more reproducible, although their final structure can also depend on polymerization conditions in a subtle way, so it should control by environmental and temperature parameters. In many applications, a functional additive is blended into a polymer matrix to enhance its properties.

However, when the polymer and functional additive are applied to a surface, the functional molecule may be easily lost. In some positive cases, it may be possible to incorporate the additive directly into the polymer as a co monomer... [3]

Hydrogels widely used in different biomedical fields due to their unique property of biocompatibility, flexible methods of synthesis, range of constituents and desirable physical characteristics. They can serve as scaffolds which provide structural integrity to tissue constructs, control drug and protein delivery to tissues and serve as adhesives or barriers between tissue and material surfaces. [5]

The mostly method used to synthesize drugs targeted to specific tissues or organs and combine the drug of interest with a ligand that can bind to a receptor on the cell surface. For example, in study, of cancer cells and metastatic tumor's blood vessels monomethylauristatin E (MMAE)-albumin was conjugated with RGD-peptides. RGD peptide sequences, which are recognized by the integrin cell surface receptor and play a key role in cell-adhesion, have also been conjugated to poly-(ethylene oxide)-block-

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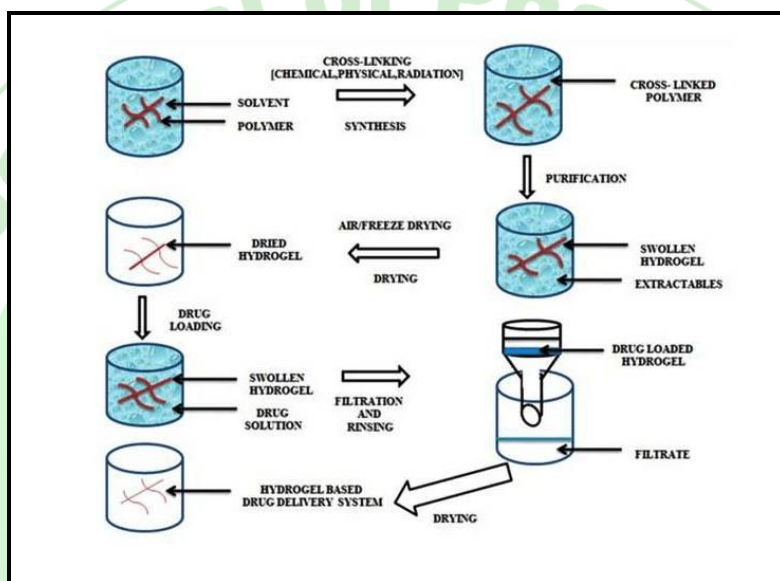
poly(ϵ -caprolactone) (PEO-*b*- PCL) micelles, with the prospect that these vehicles can be used to enhance the adhesion and uptake of drug-loaded particles

The drugs can be bound to the Cell-specific cytokines or antibodies, liposomes, and synthetic polymers can also be utilized as ligands to which the. Further, dendrimer-based micelles are incredibly beneficial which plays important role in targeted drug delivery in cancer treatment

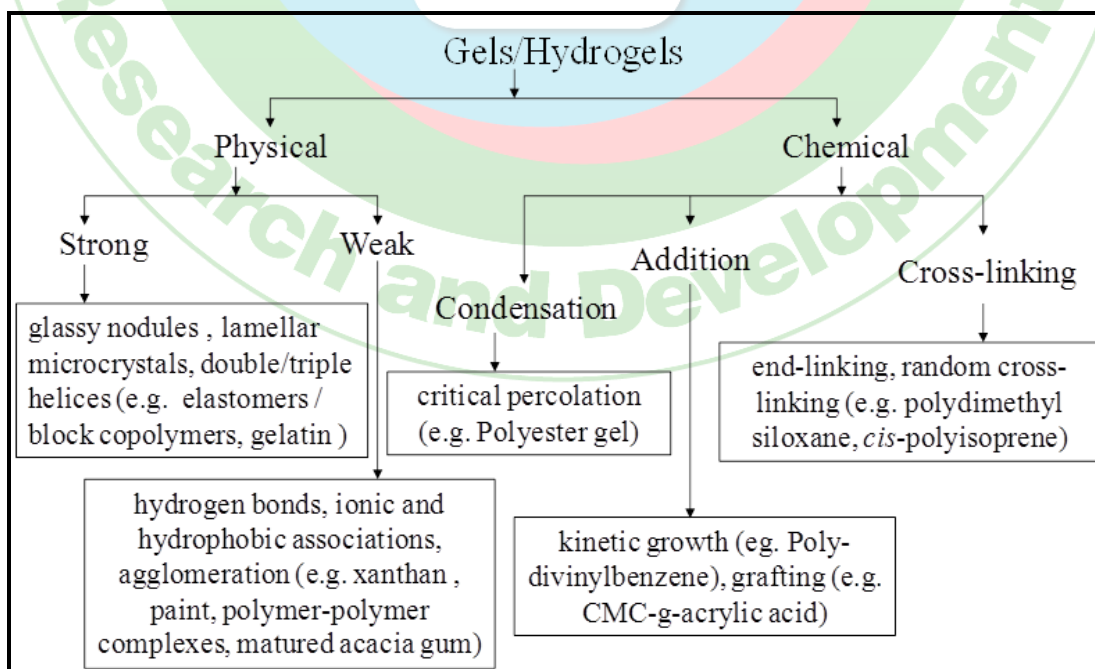
because the micelles are pH and temperature sensitive and they can be connected to ligands specific for cancerous cells.

They are specifically useful because they can reach areas of the body not accessible to macroscale hydrogels and also enter into the cytoplasm of cells. It has a large surface area that can be used as a conjugation surface to specialize the hydrogels for specific targets. [6].

PREPARATION METHODS OF HYDROGEL



TYPES OF HYDROGELS



POTENTIAL OF HYDROGEL IN CANCER THERAPY

Hydrogels in Cancer Therapy

Hydrogels are one of the rising therapies which deal with challenges today, especially with chemotherapeutic agents. Hydrogels has the potential use in hydrophobic drug as it has ability to improve water enabling concurrent delivery of multiple hydrophobic drugs. One of the examples is OncoGel during pre clinical study it was observed as monotherapy demonstrated acceptable local tolerability and no systemic toxicity. Then OncoGel increased the survival rate vs. the untreated control group and improved hind limb function with minimal side effect toxicity. OncoGel as an adjuvant to radiation therapy in an intracranial glioblastoma mouse model demonstrated improved long-term survival rate of 37.5% whereas there was no long-term survivors when treated with the radiation therapy alone. Various researches have been conducted on the use of hydrogels during peritoneal cancer surgery. The hydrogels play a huge role in prevention of post-surgical adhesions from intra-abdominal surgeries. In researchers results through various studies on animals have shown that prevention of post-surgical adhesion is possible with the use of hydrogels. These postsurgical adhesions are not inevitable, still occurring in approximately 67% to 93% of humans who undergo abdominal or pelvic surgery. Adhesions commonly occur after gynecological procedures and intraperitoneal surgeries leading severe side effects such as infertility, intestinal obstruction, chronic abdominal pain, and sometimes requiring re-surgery. Strategies to prevent the abdominal adhesion formation using thermo sensitive polymeric hydrogels have been studied in animals. Polymeric hydrogels, such as PEG-PCL-PEG with its sol-gel-sol property, have been proven to be more biocompatible, biodegradable and nontoxic. Hydrogels provide an effective barrier which will allow the peritoneal tissues and organs to separate long enough during the healing process. Thermo sensitive hydrogels have also been studied as a novel amphiphilic, multi-drug delivery system for intra-abdominal and peritoneal cancers. Intraperitoneal administration of thermo sensitive hydrogels carrying multi-drugs will be useful to

prevent the post-surgical adhesion formation and treat residual tumor margins and tissues. [1]

Poly (meth acrylic acid) (PMAA) in Cancer Treatment and Drug Delivery

One of the experiments studied from literature was Methacrylate derivatized (PVA-MA) were cross-linked in the presence of dextran and then emulsion process in aqueous solutions based on polymer-polymer immiscibility in order to form micro hydrogels. These microparticles treated with then coupled with succinic anhydride to give them a larger negative charge. They were retargeted in cancerous human colon cells after loading with doxorubicin. The decrease in the number was observed of cancers cell, hence indicates that these structures hold promise in relation for cancer treatment. [6]

In vitro experiments with HeLa cells have shown that camptothecin induced dose-dependent cell viability, and the increase in hydrogel concentration did not significantly impact the drug efficacy test, suggesting that the hydrogel did not influence biological activities of cells induced by camptothecin. The combined physical and biological results clearly indicate that the hydrogel is an appropriate 3D cell culture matrix to test the effect of camptothecin. [4]

Hydrogels for cancer melanoma therapy.

Melanoma it is a less common type of skin cancer; but, it is the most aggressive and is associated with poor prognosis malignant melanoma continues till death as a result of metastasis type of cancer. As there is increased tumor cell invasion and also it migrates to other organs. The advanced metastatic melanoma need to be treated with therapeutic methods. As immunity of cancerous patient decreases drastically and is not even able to tolerate side effect of aneoplastic agents in such case Immunotherapy has become more useful treatment for melanoma. The cytokines stimulate the patient's immune system to fight cancer. In general, this strategy was successful in fighting malignant cells. However, the main problem of conventional melanoma chemotherapy treatments is the powerful adverse effects, because the neoplastic agents do not distinguish cancer cells from healthy cells For instance, some of the side effects of cancer melanoma therapy with chemo-

and immunotherapy are anorexia, nausea, fatigue, vomiting, renal toxicity, myelosuppression, abdominal pain, dermatitis, hepatitis, and infection, among others. The side effects triggered during conventional treatment encourage the search for new therapy alternatives against cancer cells. New forms of treatments to attack cancer cells are required while simultaneously decreasing the side effects caused in healthy cells to avoid side effects; transdermal drug delivery systems appear as a promising alternative strategy to carry antineoplastic agents. There are several advantages from using encapsulated antineoplastic agents, including increased drug solubility, better bioavailability, high stability, controlled drug release, prolonged half-life, selective organs or tissue distribution, and reduction of the total dose required. Together, all the benefits outlined above can help minimize adverse side effects to a dramatic degree.

Given the adverse side effects caused by conventional therapies in patients with melanoma, a new field, large carrier-based drug delivery systems, has emerged that fights the cancerous cells while subverting the side effects. These types of drug delivery systems possess drug carriers such as nanoparticles, dendrimers, cyclodextrins, liposomes, and hydrogels that carry the bioactive antineoplastic agent inside the core/pocket/scaffold. Among these many types of drug delivery methodologies, the development of hydrogels based on natural and synthetic polymers as the drug carriers has received special attention. These biomaterials present an exciting opportunity for designing new methods of cancer therapy.

Transdermal and Topical Drug Delivery Systems

In skin cancer, topical administration is the preferred route for local delivery of therapeutic agents due to patient compliance. Now days hydrogels are screened for numerous benefits in cancer treatment due to its characteristics. With the hydrogels, it is possible to control properties of the hydrogel, such as degradation rate, long-time release, and tunable pore size. Due to the tenability of hydrogels based on the aforementioned properties, it is worthwhile to investigate hydrogels thoroughly to find optimum hydrogel formulations with specific properties to treat skin cancer.[7]

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