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Polymers Included in Natural Materials to Treat Acne

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Annotation: Biopolymers, synthetic polymers and their derivatives are commonly used in medicine and pharmacology due to significant advances in polymer chemistry and technology. The dynamic development of medical engineering has promoted. Recently, special attention of scientists has focused on medical biopolymers, especially those used for drug delivery systems, and therapeutic systems. The polymer was used as a major tool in controlling the rate of drug release from the formulations. It is also used as an employee agent to mask the bait. It is also used as a stabilizing agent and a protective agent in oral drug delivery. Polymers can bind solid dose molecules and can also alter the flow properties of liquid dose. Extended applications of polymers in drug delivery have been investigated because these polymers display unique properties that are not found in other materials. Polymers are molecules that are formed in the form of large chains and contain different functions and can also mix with materials with large and low molecules. Therapeutic applications have opened new avenues for exciting polymeric drugs, because specially designed polymers are able to provide drug materials to target diseased cells and tissues with the culture of those drugs according to the specific drugs that cause collateral damage. Recently, special attention has been drawn to chemical and biocompatible polymers, because they have the advantage of being easily degraded and non-toxic.

Keywords: Polymers, Drug Delivery, Acne Treatment, Biocompatible Polymers, Dermatological Applications, Pharmaceutical Polymers.

Introduction

Pharmaceutical polymers are large molecules made up of several thousand atoms, and they are used as effective therapeutic agents and are less toxic and more transitional atoms. The use of polymeric drugs has increased in recent times and at the level of modern global research and attention to addressing problems due to the deterioration of many different medicines, where they are effective Benefit in the controlled distribution and on-time delivery of anti- inflammatory drugs, antibiotics, chemotherapy drugs, anesthetics and vaccines. (1) The importance of pharmaceutical polymers in pharmaceutical applications, as it was known for their use in capsules for preserving medicine and as a coating for medicines that have an unpleasant taste or to enhance drug stability, and extend the life of drug release. Medical polymers are used in the field of biodegradable surgical sutures, as a means of regulating the secretion and absorption of some drugs by the body according to a specific time mechanism, so the polymer acts as a carrier and conductor of the drug. Pharmaceutical polymers have been used with high efficiency to treat cancerous tumors by closing the tiny capillaries that feed cancerous tumors, then the polymer decomposes and is expelled from the body after establishing an effective blockade on the tumor.

Materials

Drug Carriers

Covalent bonding between drugs and polymers was first introduced by Rangster in 1975 where the main features of polymeric drug transporters are storage effect, unique drug, distribution in the body, and drug efficacy. Most drugs with small molecules do not prolong the biological system, and thus the use of drugs is very difficult, as they are concentrated within the primary tissues used, and thus diffusion is slow. The drug polymer is characterized by appropriate behavior and polymeric carriers have desirable properties such as continuous treatment, slow release and long-term effectiveness A model of an effective drug loaded on a polymeric chain similar to this one has been developed polymeric similar to that shown in Figure (1.1)

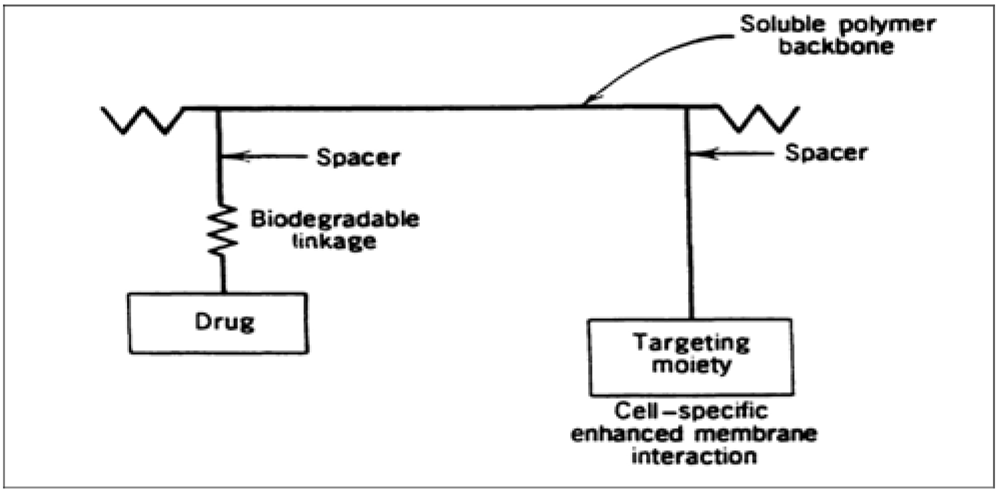

Figure (1.1): Polymeric drug carrier

In this figure, the association of four stable groups on the main chain of the biopolymer and its degradable is shown, namely:

1. Drug
2. Spacer
3. Transport system
4. Soluble group of the entire biopolymer system.

The drug is the entity that causes the physiological response, as it can be permanently synthesized by stable bonds between the drug and the polymer and can be removed by hydrolysis or enzymatic and metabolic processes that occur in vivo. As for the transport system of soluble polymeric drug carriers, it must contain hydrophilic groups such as (carboxylates, quaternary amines, and sulfonates). And the presence of non-polar groups that further improves the susceptibility of hydrophobic and lipophilic groups.

To prepare the best approach for polymeric carriers of pharmaceutically active compounds is to modify the formation of preformed polymers and this method provides a wide range of polymer types that are simple in interactions as well. Hydrophilic polymers with biodegradable polymer main chain lead to the preparation of orally administered polymeric systems. A limitation imposed on polymeric interactions is that drug interaction on the polymeric chain may be low when it is directly substituted on the polymer main chain. This is as a result of the steric obstruction of the adjacent side groups, meaning that it has a limited efficiency as a result of replacing the drug compounds directly on the polymeric chain and thus has a limited loading and a very slow decomposition of the drugs loaded directly on the main chain of the polymer. This problem has been overcome by the spacing between the drug groups and the main chain by Bridge Groups Road.

By controlling the partial weight of the drug-carrying polymer, it is possible to regulate whether the drug passes through blood barriers (membranes) or is excreted through the kidneys, lymph nodes, spleen, liver or other basic organs that have the ability to transport biopolymers from Through tissue and success in design and manufacturing by predicting in vivo performance in terms of polymer drug delivery. On the basis of molecular weight. There are polymeric carriers of drugs that perform more than the drug. As a result of the occurrence of many variables such as polymer chain formation, composition, multiple compensation and solubility, all of this affects the behavior of the polymeric drug. In pharmaceutical polymers, there are at least three main elements that determine the quality of use, which are the main chain, the presence of soluble groups, and bond groups that have the ability to decompose, for example (Fig.1.2)

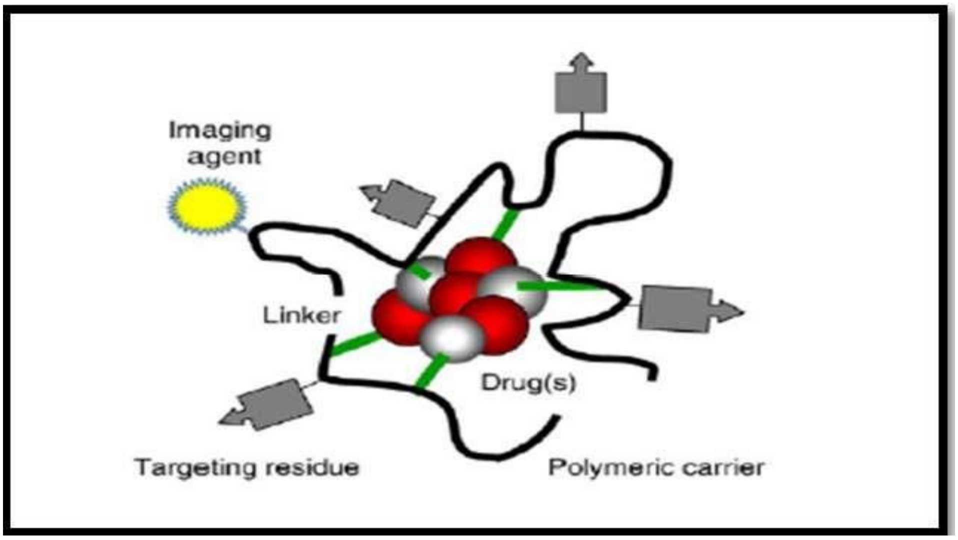

Figure (1.2). The main components of successive pharmaceutical polymers

Successive pharmaceutical polymers are one of the widely evaluated families of nanocarriers that are water soluble but biocompatible with non-biodegradable. Because it has many functional groups that allow the coupling of hydrophobic groups with anticancer drugs on the main chain of the polymer via enzymatic hydrolysis of the bonds.

Where new polymeric systems containing the drug have been proposed, taking into account the control of the following:

1. The appropriate time for the arrival of the pulmonary drug (reduces the accumulation of the drug in the lung).
2. Improving surface chemistry to improve performance (increase delivery efficiency).
3. Properties that reduce the rate of removal of particles in the lung (increasing drug delivery time). Thus, taking advantage of the monitoring method in the lung, including many hormones, asthma medications, insulin, vaccines, and genes.

2- Pro-drug:

Adjuvant drugs were first introduced by Albert in the 1950s and are inactive chemical drug derivatives that are used to temporarily alter the physical properties of drugs to increase benefit or reduce toxicity.

A drug adjuvant refers to a pharmacologically inactive compound that is converted into an active substance by any chemical or by metabolic means. The term drug-latentiation expresses the concealment of problems for a period of time. It was recently coined, and the concept of drug adjuvant was attempted in order to solve various problems. The definition of (drug- latentiation) was extended to include the regeneration of the drug by enzymes and its conversion to the original compounds by decomposition of the binding groups.

The adjunct drug approach has emerged as a tool in overcoming various problems of drug formulation and control such as chemical instability, poor aqueous solubility, and insufficient penetration into the brain, when oral absorption is insufficient, causing local irritation and toxicity.

There is justification for the fact that the use of the original compound has been overcome, and these temporary forms can be converted into the original free compound that can have its pharmacological activity. Thus, an adjuvant is defined as a biologically inactive derivative of the parent molecule of the parent drug, which usually requires chemical or enzymatic transformation within the body to release the active drug and has improved properties and a longer release than the original drug. These attractive features make for adjunct drugs a recognized strategy for improving drug specifications, to enhance the physical characteristics, pharmaceutical properties, biological or pharmacokinetic properties of pharmacologically active compounds, thus increasing the potential drug benefit. As Figure (1.3).

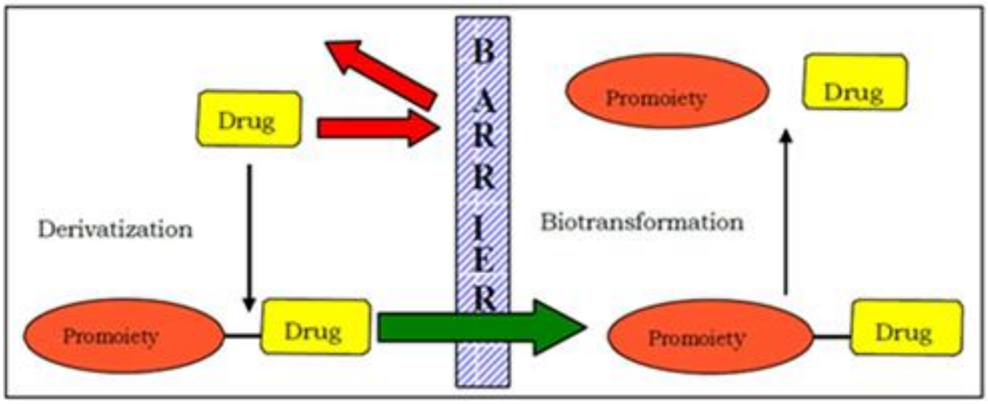

Figure (1.3) Schematic representation of the concept of drug assistance

Successive drug polymers have become non-steroidal anti-inflammatory drugs such as ibuprofen and indomethacin. It is of importance as a polymeric drug adjuvant, as these systems were developed in order to reduce problems and reduce gastrointestinal side effects by controlling the rate of concentration, duration, and location from which this type of polymeric drug is released.

It is designed so that the drug works for a long time and is used by injection or as an adjuvant drug under the skin.

The purpose of designing an adjuvant drug is to mask the undesirable properties of the drug, such as the lack of solubility in water or fat and the lack of selectivity. Chemical instability, unpleasant taste, irritating odor, difficulty in metabolism and due to toxicity.

The binding of the drug by degradable aggregates with the drug carrier material as shown in Figure (1.4)

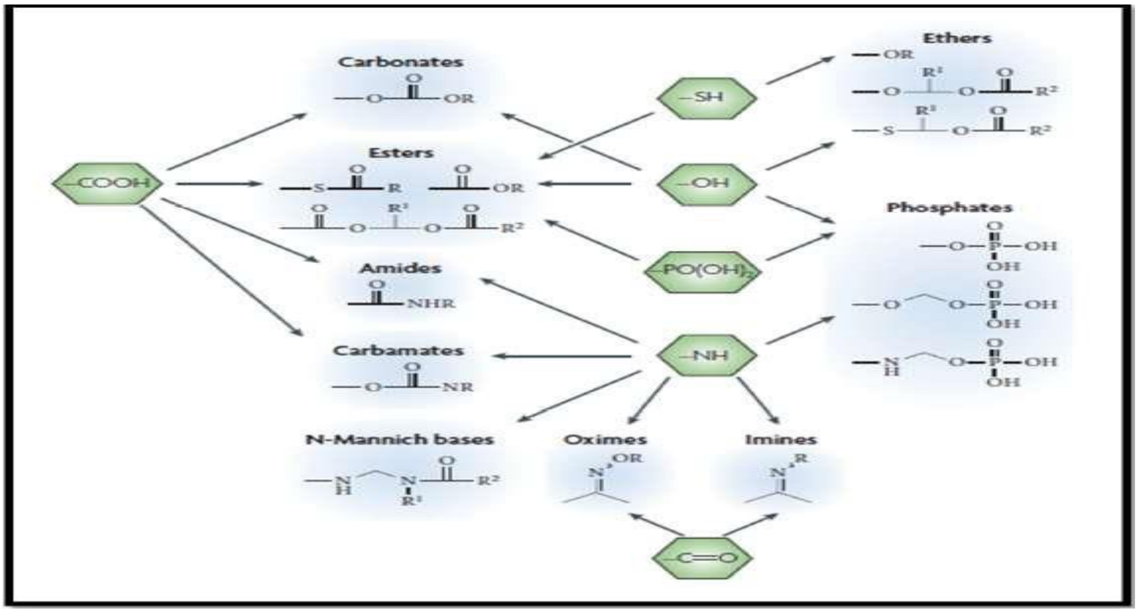

Figure (1.4) represents the common functional groups on the original drugs and their loading on an adjuvant drug

In general, the rationale behind the use of adjunct medication is to improve absorption, metabolism, and excretion, and to reduce unwanted toxicity of parent medication.

The most common functional groups that are capable of designing an adjuvant drug include groups (carboxylic, hydroxyl, amine phosphate, and carbonyl groups). Adjuvant drugs are usually produced by substitution of these groups and include (esters, carbons, amides, phosphates, oximes).

Polymers inside and their effectiveness in treating acne

Acne is one of the common skin diseases that cause severe inconvenience to millions of people around the world, but the matter is more disturbing and dangerous is the effects of that disease in the form of sunken scars of different intensity spread throughout the face.

The danger of acne scars is that they are a permanent effect that persists even after the inflammatory disease has healed. In some cases, the scars are large and deep, making them very visible, which causes great discomfort and negatively affects the overall appearance.

The good news is that treating acne scars is no longer an impossible thing, as there are many treatment methods and techniques that contribute to eliminating this problem, and through the following paragraphs, “Cosmetic” reviews the most important and most effective of these methods.

In the past, acne scars were one of the intractable health problems, as they are one of the manifestations of deformation of the skin and it took a long time to treat, and it was rarely eliminated permanently, but today the matter is different as there are many mechanisms for treating these scars and varied between topical and surgical treatments to Besides the use of advanced technologies such as laser, cooling technology, and others.

The multiplicity of medical techniques has made the treatment of acne scars easy, regardless of the severity of the scars and the extent of the deterioration of the condition. Among the treatment methods that have proven effective in this regard are the following:

Methodology

The methodology for this study follows a qualitative, experimental approach to investigate the role of polymers in treating acne and their potential applications in pharmaceutical drug delivery. The research focuses on analyzing different polymeric systems, their chemical compositions, and their efficacy in acne treatment. A literature-based framework was utilized to assess previous studies on biocompatible polymers, polymeric drug carriers, and their impact on controlled drug release. Various polymeric formulations were examined for their ability to enhance drug stability, prolong drug release, and target affected skin areas while minimizing side effects.

Experimental procedures involved evaluating the physical and chemical properties of selected polymers, including their molecular weight, hydrophilicity, and degradation patterns. The study also analyzed how polymeric carriers interact with active pharmaceutical ingredients, ensuring optimal drug absorption and bioavailability. Key parameters such as polymer-drug compatibility, release kinetics, and therapeutic effectiveness were assessed through in vitro testing methods. Additionally, the effectiveness of polymer-based treatments was compared to conventional acne treatment options, considering factors like patient compliance, treatment efficiency, and potential side effects.

The findings were further analyzed through comparative evaluations of different polymer structures and their suitability for dermatological applications. Statistical data from previous studies and experimental trials were synthesized to draw meaningful conclusions regarding the most effective polymeric formulations. The study aims to provide insights into innovative polymer-based acne treatments, emphasizing their advantages in targeted drug delivery, reduced toxicity, and enhanced patient outcomes.

Results and Discussion

Laser treatment of acne scars

The treatment of acne scars with laser is the most widespread treatment method around the world in terms of removing facial scars, due to the practical experience of the effectiveness of this technique and achieving high success rates exceeding 98%, in addition to that it is a completely safe non-surgical procedure as it is used in It is performed with different types of lasers of gradient intensity, which makes it suitable for different skin types.

Laser technology works to remove superficial and deep facial scars through the same procedure that relies on shining micro-laser beams on the skin and passing them over the affected areas, as follows:

Superficial scars: The laser beams exfoliate the upper layer of the skin, allowing the superficial scabs and scars to be removed immediately.

Deep scars: The thermal energy resulting from the penetration of laser beams into the lower layers of the skin stimulates the dermis layer to produce skin collagen compounds, which leads to the renewal of damaged skin cells and the refilling of the hollows and pits left by acne scars.

The treatment of acne scars with laser requires undergoing several treatment sessions, the number of which is determined by the doctor according to the patient's condition, but in general it usually ranges between 3 to 4 sessions, and the difference can be observed starting from the first session with regard to superficial scars, while deep scars It begins to fade gradually over the few weeks after the sessions until it disappears completely.

1. Remove acne scars with SECRET RF technology

Secret RF technology is one of the latest technologies used in the field of plastic surgery. This technology was developed with the aim of using it in various cosmetic purposes, including anti-aging, skin tightening and eliminating wrinkles, in addition to treating acne scars and hyperpigmentation cases.

Secret FR device relies on achieving its effect on micro-needles that penetrate into the skin at different depths ranging from 0.5 mm to 3.5 mm, depending on the patient's condition. These needles emit radio frequency waves in the lower layers of the skin and then generate enough heat energy to cause Immediate contraction of the muscle membrane, which leads to reducing the gaps between pores and filling the skin cavities, which contributes to hiding wrinkles and scars, and thermal coagulation resulting from frequency waves helps stimulate skin cells to reproduce collagen, which leads to improving skin health, restoring its freshness and concealing Acne scars permanently and sometimes resort to chemical peeling

Secret purification has achieved a wide spread around the world in record time and is considered today as the strongest competitors for treating acne scars with laser, due to its advantages, most notably:

1. Treating all skin problems at the same time through one technique
2. Ultra-fine SCREET needles, which reduce the impact of trauma on unaffected areas
3. Effective and fast results that can be noticed from the first session.
4. Secret FR technology is suitable for all skin types, including sensitive skin
5. It produces minor side effects that are negligible compared to the combination of laser and photodynamic techniques

Conclusion

The findings of this study underscore the significant role of polymers in pharmaceutical applications, particularly in the controlled release and targeted delivery of acne treatments. The analysis demonstrated that biocompatible polymeric systems enhance drug stability, prolong therapeutic effects, and minimize adverse reactions, making them highly effective in dermatological treatments. The study also highlighted that polymer-drug interactions influence drug absorption and bioavailability, emphasizing the need for precise formulation strategies. These findings have important implications for the development of advanced polymer-based acne therapies that offer improved patient compliance and therapeutic outcomes. However, further research is needed to optimize polymeric formulations, explore novel biodegradable polymers, and assess their long-term efficacy and safety in clinical applications. Future studies should also investigate personalized polymeric drug delivery systems that cater to individual skin conditions, ensuring enhanced treatment precision and reduced side effects.

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