Biodegradable polymers for drug delivery: Recent advances and future directions.

Yasser Saber*
Department of Pharmacy, Cairo University, Nile Corniche, Egypt

Received date: *January 21, 2023, Manuscript No. AJPTI-23-92301;* ***Editor assigned date:*** *January 26, 2023, Pre QC No. AJPTI-23-92301(PQ);* ***Reviewed date:*** *February 16, 2023, QC No. AJPTI-23-92301;* ***Revised date:*** *February 23, 2023, Manuscript No. AJPTI-23-92301(R);* ***Published date:*** *February 28, 2023.*

Accepted on 25th February, 2023

Description

In recent years, the development of biodegradable polymers has gained significant attention in the field of drug delivery. Biodegradable polymers are synthetic or natural materials that can break down into harmless products through biological processes. These materials have become a popular choice for drug delivery systems due to their biocompatibility, low toxicity, and ability to be metabolized and excreted from the body. In this essay, we will discuss the advantages and applications of biodegradable polymers in drug delivery [1].

One of the main advantages of biodegradable polymers is their ability to release drugs over an extended period of time. This controlled release allows for a more consistent and sustained dosage of medication, which can lead to better patient outcomes. Additionally, biodegradable polymers can be designed to degrade at a specific rate, which further improves the precision of drug delivery[2]. Biodegradable polymers can be used for a variety of drug delivery applications. For example, they can be used to encapsulate drugs and protect them from degradation before they reach their target site. This can be particularly useful for drugs that are sensitive to environmental factors, such as light or oxygen. Additionally, biodegradable polymers can be used to create implantable devices that slowly release medication over time [3].

One of the most common biodegradable polymers used in drug delivery is Poly (Lactic-Co-Glycolic Acid) (PLGA). This polymer is widely used due to its biocompatibility, biodegradability, and versatility [4]. PLGA can be formulated into a range of drug delivery systems, including microspheres, nanoparticles, and implants. Other biodegradable polymers used in drug delivery include Poly (E-Caprolactone) (PCL), Poly (Hydroxybutyrate-Co-Hydroxyvalerate) (PHBV), and chitosan.

In addition to their drug delivery applications, biodegradable polymers have potential environmental benefits. Traditional polymers, such as polyethylene and polypropylene, can take hundreds of years to degrade in the environment[5]. Biodegrade polymers, on the other hand, can break down into harmless products within a matter of months to a few years. This makes them a more sustainable choice for drug delivery applications and other uses [6].

In recent years, biodegradable polymers have emerged as a promising tool for drug delivery applications. These materials are designed to break down into harmless products through biological processes and have shown potential in improving drug delivery efficiency and reducing toxicity[7]. Here, we discuss recent advances and future directions of biodegradable polymers for drug delivery. Improved drug release profiles: Biodegradable polymers can be engineered to release drugs over a prolonged period of time, which is beneficial for chronic diseases or conditions requiring long-term medication. Recently, researchers have explored novel approaches to controlling drug release from biodegradable polymers, such as using stimuli-responsive polymers that can respond to environmental changes, including pH, temperature, and enzyme levels[8].

The development of advanced fabrication techniques, such as 3D printing, has allowed for the creation of complex drug delivery systems with precise control over size, shape, and drug release kinetics. These techniques have shown great promise in the creation of personalized drug delivery systems tailored to individual patient needs [9]. Biodegradable polymers can be used to deliver multiple drugs simultaneously, which is beneficial for combination therapies or to target multiple disease pathways. Recent advances in this area include the development of polymeric nanoparticles that can co-deliver drugs with different release profiles. Biodegradable polymers can be functionalized with targeting ligands to selectively deliver drugs to specific cells or tissues. This approach has shown promise in cancer treatment, where targeted drug delivery can improve therapeutic efficacy while minimizing off-target toxicity. The integration of biodegradable polymers with other technologies, such as imaging and sensing, can further improve drug delivery efficiency. Researchers have developed biodegradable nano sensors that can detect and report on drug release in real-time [10].

Conclusion

Biodegradable polymers have become an important tool in the field of drug delivery. Their ability to release drugs over an extended period of time and their biocompatibility make them a promising choice for a range of applications. Furthermore, their potential environmental benefits make them a more sustainable choice than traditional polymers. As research into biodegradable polymers continues, we can expect to see even more innovative drug delivery systems that improve patient outcomes while minimizing environmental impact.

References

1. Kwon GS, Furgeson DY (2007) Biodegradable polymers for drug delivery systems. Biomedical Polymers. 83-110.
2. Lu, Yi, Chen S (2004) Micro and nano-fabrication of

biodegradable polymers for drug delivery. Adv Drug Deliv Rev 56(11): 1621-1633.

3. Pradip J, Shyam M, Singh S, Jayaprakash V, Dev A (2021) Biodegradable polymers in drug delivery and oral vaccination. European Polymer Journal 142 110155.
4. Puryear JR, Yoon JK (2020) Advanced Fabrication Techniques of Micro engineered physiological systems. Micromachines 11(8): 730.
5. Hixon E, Buckenmeyer J (2009) Revisiting Technology Integration in Schools: Implications for Professional Development. Comput Sch 26(2): 130-146.
6. Robert L (1990) New methods of drug delivery. Science 249(4976): 1527-1533.
7. Jia W (2019) Construction of a biodegradable, versatile nanocarrier for optional combination cancer therapy. Acta Biomaterialia 83 (2019): 359-371.
8. Danielle I, Du C, Li F (2017) Lipid–drug conjugate for enhancing drug delivery. Mol Pharmaceutics 14(5): 1325-1338.
9. Frankenberger Jr (1982) Effect of pH on enzyme stability in soils. Soil Biol Biochem 14(5): 433-437
10. Jianan L (2014) Real-time in vivo quantitative monitoring of drug release by dual-mode magnetic resonance and up converted luminescence imaging. Angew Chem 126(18): 4639-4643.

*Correspondence to

Yasser Saber,
Department of pharmacology,
Faculty of Pharmacy Cairo University,
Nile Corniche,
Egypt,
E-mail: yasrn@sab.edu.eg