



Advantages and Applications of Implantable Drug Delivery Systems

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DESCRIPTION

Cancer Implantable drug delivery system has great potential to safely and effectively deliver chemotherapeutic agents to the affected area without causing any side effects. Brain cancer, prostate cancer, and bladder cancer are just a few examples of implants on the market. The gliadel wafer was approved as one of the first implantable brain tumor treatments to deliver chemotherapy directly to the tumor site. Another example is a biodegradable zoladex implantable rod that releases goserelin acetate to treat prostate cancer.

For eye treatment a variety of implantable systems, including membrane activating devices, implantable silicone devices, and implantable infusion systems, have been studied to provide long-term ocular drug delivery. Ocusert, which contains a pilocarpine base and alginic acid in a drug reservoir surrounded by an ethylene vinyl acetate membrane that controls the release rate, is an example of a membrane control system. The system provides a weekly zero-order pilocarpine delivery at 20-40 micrograms per hour following the first burst. Ocusert is well tolerated in adults, has few side effects, and provides satisfactory intraocular pressure control. However, it is less tolerable in geriatrics, which has the highest need for treatment.

Contraception the FDA recently approved the sale of Norplant, a subcutaneous implant for long-term release of levonorgestrel (a contraceptive). The device consists of six silicon membrane capsules, each containing 36 micrograms of levonorgestrel, placed on the inner surface of the upper or forearm *via* trocar, creating a single trocar entry point. These capsules release 70 micrograms per day for the first 100 days and steadily decrease to 30 micrograms per day after about 800 days, with this release rate continuing for 5 years. Other polymer-based systems being studied for contraception include a silicone rubber vaginal ring

that is used for 3 to 6 months with a monthly removal period of 1 week during menstruation.

progestasert is an intrauterine device of ethylene vinyl acetate copolymer that can be injected for at least 1 year and contains a suspension of injectable microspheres or rods made of biodegradable polymer. Dental Applications Polymer implants are valued in many dental applications, including long-term topical administration of fluoride antibacterial agents and antibiotics. Stannous fluoride is incorporated into various dental cements to supply sustained release of fluoride. Different hydrogels dispersed in hydroxyethyl methacrylate and methyl methacrylate copolymer hydrogels are coated with an outer layer of the same copolymer in different proportions to be the rate-determining factor for drug release. Approximately 8 mm long, a device containing 42 mg of fluoride in the core was attached to the buccal surface of the maxillary first molar and designed to release 0.5 mg of fluoride per day for 30 days.

Currently, much research is being done in the field of implantable drug delivery systems. Despite this fact, much work is still needed in the areas of biodegradable and biocompatible substances, drug release kinetics, and further improvements of current systems before using many of these formulations. With this feature, scientists continue to expect that many of these systems can be manufactured with the highest zero-order emission kinetics profile *in vivo* over a long period of time and can be used for long periods of time with constant manufacturing. Some of these drugs are continuously developed from proteins and peptides that are very unstable when taken orally. The use of a new type of sustained release drug delivery system allows such drugs to be delivered at a constant rate over a longer period of time, decreasing intake of multiple doses. Over the next few years, improvements to new implantable systems are expected to reduce the cost of drug treatment, increase drug efficacy, and improve patient compliance.

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Received: 27-May-2022, Manuscript No. BLM-22-17413; **Editor assigned:** 30-May-2022, Pre QC No. BLM-22-17413 (PQ); **Reviewed:** 13-June-2022, QC No. BLM-22-17413; **Revised:** 20-Jun-2022, Manuscript No. BLM-22-1 7413 (R); **Published:** 27-Jun-2022, DOI: 10.35248/0974-8369.22.14.495.

Citation: Sukasem C (2022) Advantages and Applications of Implantable Drug Delivery Systems. *Bio Med.* 14:495.

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