Implant-associated local drug delivery systems based on biodegradable polymers: customized designs for different medical applications

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Implants providing controlled, local release of active substances are of interest in different medical applications. Therefore, the focus of the present article is the development of implant-associated diffusion- or chemically controlled local drug delivery (LDD) systems based on biodegradable polymeric drug carriers. In this context, we provide new data and review our own recently published data concerning the drug release behavior of diffusion-controlled LDD systems in relation to the kind of polymer, drug content, coating mass/thickness, and layer composition. We demonstrate that polymers allow a wide range of control over the drug release characteristics. In this regard, we show that the glass transition temperature of a polymer has an impact on its drug release. Additionally, the blending of hydrophobic, semicrystalline polymers with amorphous polymers leads to an increase in the rate of drug release compared with the pure semicrystalline polymer. Moreover, the percentage loading of the embedded drug has a considerable effect on the rate and duration of drug release. Furthermore, we discuss chemically controlled LDD systems designed for the release of biomolecules, such as growth factors, as well as nanoparticle-mediated LDD systems. With our own published data on drug-eluting stents, microstents, and cochlear implants, we highlight exemplary implant-associated LDD systems designed to improve implant performance through the reduction of undesirable effects such as in-stent restenosis and fibrosis.
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