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A review of advances in injectable drugs and devices

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Recent advancements in coatings, mechanisms and device designs have led to prefilled biological in patient-friendly drug-device combination products that were not that much reliable and possible few years ago. Latest prefilled drug cartridges had made it easier to use and have reduced the cost of injectable pens and auto injectors, making them accessible to a larger segment of the chronically ill patients. Injectors with advanced features such as variable dosing, dose counters and audible cues are making self-administration safer for patients prescribed immune modulators with black box warnings. To streamline the drug-device development process, drug developers are increasingly aligning themselves with device suppliers, increasing the level of concurrent engineering, identifying design challenges earlier and minimizing possible delays that could result. This trend represents risks for injecting drug firms competing for device solutions for their sophisticated formulations. It is also an opportunity for smaller device suppliers who are able to demonstrate the financial and technological resources to address the needs of injectable drug developers.

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Development of innovative resveratrol-loaded solid lipid nanoparticles using natural *Theobroma grandiflorum* seed butter

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Solid lipid nanoparticles (SLNs) have been attracting increasingly attention as efficient drug carriers for dermal application. The use of natural lipids (such as butters) appears very promising, but they are still a challenge to overcome. Therefore, the aim of this work was to develop new resveratrol-loaded SLNs using natural *Theobroma grandiflorum* seed butter (R-SLN) to enable further use in topical application. For this, the *T. grandiflorum* seed butter chemical composition was analyzed by GC, presenting oleic, stearic and arachidic acid as the main constituents (41.80%, 34.40% and 10.90%, respectively), which are already known as skin penetration enhancers. The R-SLN was prepared by the high shear homogenization method. The *T. grandiflorum* seed butter and resveratrol (0, 2 and 10 mg) were used as the lipid phase and Pluronic F127 and ultrapure water as the aqueous phase. Both phases were heated to 55°C, separately, and the molten lipid was then dispersed in the aqueous phase by high-speed stirring in an Ultra-Turrax for 1 min at 12,000 rpm, followed by 10 min of 35% intensity sonication. The nanodispersions were cooled at room temperature. Dynamic light scattering measurements revealed a hydrodynamic diameter of 140-147 nm, narrow particle size distribution (0.20-0.34), and zeta potential between -26.36 and -36.27 mV. These characteristics remained unchanged for 30 days, with no statistically significant differences ($p>0.05$), suggesting good colloidal stability. The drug encapsulation efficiency of R-SLN 2 mg and R-SLN 10 mg were 54.35% and 73.27%, respectively. The SLNs prepared in this study suggest a promising use in topical delivery, since seed butter presents constituents suitable for this application and the nanoparticles exhibit good physicochemical characteristics.

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