Havazelet Bianco-Peledet et al., Pharm Anal Acta 2016, 7:1 (Suppl)
http://dx.doi.org/10.4172/2153-2435.C1.027

OMICS International
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8th International Conference and Exhibition on
Pharmaceutics & Novel Drug Delivery Systems
March 07-09, 2016 Madrid, Spain

Composite hydrogels: An innovative approach for controlled release of hydrophobic drugs

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Many of the new medical entities are extremely hydrophobic. These drugs offer advantages such as better targeting and efficiency. However, their low water solubility is related with low bioavailability and risk of aggregation upon intravenous administration. We present an innovative methodology for sustained delivery of hydrophobic drugs using composite hydrogels, prepared by embedding oil-in-water microemulsions in hydrophilic hydrogels. Creating composite hydrogels increases drug loading due to its higher solubility in the oil droplets, while the crosslinked hydrogel matrix could be readily used as a solid controlled delivery vehicle. We formulated alginate and chitosan composite hydrogels from pharmaceutical accepted components. The oil droplets diameter was shown to be 10 nm by dynamic light scattering, cryo-TEM and SAXS. All hydrogels were capable of loading hydrophobic compounds with a wide range of logP. The gels were clear with no precipitations, indicating the solubility of the drugs in the gels. Release profiles from hydrogels with various concentrations of polymer and crosslinker demonstrate the applicability of this system as a controlled delivery vehicle, and suggest that the release rate is governed by the network properties. The release from alginate composite hydrogels was similar for different microemulsion formulations, various drugs and increasing concentrations of a drug. These findings indicate that these hydrogels could potentially act as a generic system, where the properties of the release do not depend on the drug but rather on the attributes of the gel. The release mechanism from chitosan hydrogels was more complex due to polymer–microemulasion interactions.

Biography

Havazelet Bianco-Peled is a Professor of Chemical of Engineering since 1999. She has received several awards for her professional accomplishments. She has written more than 70 research publications in reputed journals, edited a book, and has ten patent applications either granted or pending. She is the Founder and CSO of SEAlantis Ltd., a company that develops, manufactures and commercialize novel biomimetic tissue adhesives base on a technology invented in her lab.

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