Title:	Cellulose-metallothionein matrix for metal binding
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Keywords:	Bacterial cellulose Metallothionein Epoxidation Covalent conjugation Metal binding
Issue Date:	2018
Publisher:	Elsevier B.V.
Citation:	Carbohydrate Polymers, 192, pp. 126-134
Abstract:	In this report, we have modified bacterial cellulose to a metal binding matrix by covalently conjugating physiological metal chelators known as metallothioneins. The hydroxyl groups of the native bacterial cellulose from Gluconobacter xylinus are epoxidized, followed by the covalent conjugation with the amine groups of the proteins. For the first time, a covalent conjugation of protein with bacterial cellulose is achieved using the epoxy-amine conjugation chemistry. Using this protocol, 50% mass by mass of the metallothionein could be attached to bacterial cellulose. The morphological features and porosity of the modified cellulose are different compared to pristine bacterial cellulose. Also, the conjugated material has better thermal stability. A five-fold enhancement in the metal binding capacity of the metallothionein conjugated bacterial cellulose is achieved as compared to pristine bacterial cellulose. Cellular metabolic assay and membrane integrity assay on MCF and HeLa cell lines showed no significant toxicity of the conjugate material. This bacterial cellulose-metallothionein conjugate can be explored for health care applications where management of metal toxicity is crucial. Further, the epoxy-amine chemistry for covalent conjugation of protein can be applied for several other types of proteins to develop specific functional biocompatible and biodegradable cellulose matrices.
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