

Safer Surfactants from Naturally Occurring Polysaccharides for Pharmaceutical Applications

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Octylphenol ethoxylate (OPE), a widely-used non-ionic surfactant, is classified as a Substance of Very High Concern by the European Chemicals Agency. In fact, they are being phased out because of their endocrine disrupting effects and harm that they pose to aquatic life, in particular by disrupting estrogen-mediated reproductive cycles. OPE is used in medical diagnostic applications, such as in the Siemens STRATUS CS Cardiac assay, to remove non-specific proteins in binding assays, which is critical for minimizing background signals and ensuring high assay sensitivity. Therefore there is an immediate need to replace OPE with safer, non-toxic alternatives. Surfactants synthesized using green chemistry methodology and derived from renewable resources have become a major research focus. Here we present a new approach for converting readily available polysaccharides (specifically pectin and pectic acid) derived from fruit waste into safely biodegradable surface-active polymers. Detailed structural characterizations of the novel polymers, along with surface and interfacial properties of these surfactants will be presented. The surface tension of these polysaccharide-based surfactants is similar to that of OPEs and hence can serve as a more sustainable alternative to OPE in a variety of protein analysis applications. To establish the safety of these surfactants, detailed cytotoxicity evaluations using relevant human cell line models of potentially exposed tissues (e.g. dermal fibroblasts) were carried out. In accordance to the Organization for Economic Cooperation and Development guidelines (OECD), biodegradation studies of these pectin-based surfactants were performed, the results of which also will be presented.