Interactions between Surfactants in Solution and Electrospun Protein Fibers: Effects on Release Behavior and Fiber Properties - DTU Orbit (22/12/2018)

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Intermolecular interaction phenomena occurring between endogenous compounds, such as proteins and bile salts, and electrospun compounds are so far unreported, despite the exposure of fibers to such biorelevant compounds when applied for biomedical purposes, e.g., tissue engineering, wound healing, and drug delivery. In the present study, we present a systematic investigation of how surfactants and proteins, as physiologically relevant components, interact with insulin-loaded fish sarcoplasmic protein (FSP) electrospun fibers (FSP-Ins fibers) in solution and thereby affect fiber properties such as accessible surface hydrophilicity, physical stability, and release characteristics of an encapsulated drug. Interactions between insulin-loaded protein fibers and five anionic surfactants (sodium taurocholate, sodium taurodeoxycholate, sodium glycocholate, sodium glycodeoxycholate, and sodium dodecyl sulfate), a cationic surfactant (benzalkonium chloride), and a neutral surfactant (Triton X-100) were studied. The anionic surfactants increased the insulin release in a concentration-dependent manner, whereas the neutral surfactant had no significant effect on the release. Interestingly, only minute amounts of insulin were released from the fibers when benzalkonium chloride was present. The FSP-Ins fibers appeared dense after incubation with this cationic surfactant, whereas high fiber porosity was observed after incubation with anionic or neutral surfactants. Contact angle measurements and staining with the hydrophobic dye 8-anilino-1-naphthalenesulfonic acid indicated that the FSP-Ins fibers were hydrophobic, and showed that the fiber surface properties were affected differently by the surfactants. Bovine serum albumin also affected insulin release in vitro, indicating that also proteins may affect the fiber performance in an in vivo setting.