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Crystallization of lysozyme with surfactants (Poloxamer 188, Cremophor® RH 40 and Solutol® HS 15)

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The increasing number of protein products needed as therapeutic agents, have attracted significant amount of research. This is to improve the stability, efficacy and route of administration of these products. However, new technologies need to be employed to embark on such research. Lysozyme (chicken egg white), a model protein, was used in this study. Three different excipients (Poloxamer 188, Cremophor® RH 40 and Solutol® HS 15) and how crystallizationand varying concentrations of excipients (0.25, 0.5,1% w/v for poloxamer 188 and 0.03%w/v for Cremophor® RH 40 and Solutol® HS 15)affect the overall stability of lysozyme were investigated. Unprocessed and crystallized lysozyme were characterized using differential scanning calorimetry (DSC), Fourier transform Infra-Red (FT-IR) and polarized microscopy. Additionally, yield and biological activity analyses were performed.

Microscopic analysis showed that all prepared crystals were tetragonal. The DSC data revealed that all excipients within protein crystals resulted in reduction of the apparent lysozyme denaturation temperature (Tm decreased from 193 to about 186°C). However, the presence of surfactants improved the % yield of protein crystals compared to crystallized lysozyme alone. In FT-IR data, crystals with Cremophor® RH 40 and Solutol® HS 15 maintained the secondary structure of the model protein (lysozyme) better than did poloxamer 188. All surfactants retained the native structure of the protein as indicated by biological activity assays. Accordingly, the processing technique and excipients had an influential effect on protein integrity and activity.

Biography

Amal Ali Elkordy is a Senior Lecturer in Pharmaceutics, University of Sunderland, UK. Her area of research interest is the stabilisation of protein formulations and their delivery via oral and pulmonary routes. Her work in this field has been recognised by three awards. Her more recent work is concerned with the enhancement of poorly-water soluble drugs using for example liquisolid technology, resulting in the award of three prizes. She also has research interests in gene therapeutics (awarded national recognition from the College of Mental Health Pharmacists, 2010). She has published more than 15 papers in reputed journals.

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