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Insights into flash-nanoprecipitated drug solubilisation during in vitro digestion in milk using the SAXS/WAXS beamline

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Strategies to administer drugs in a low cost and an effective manner are priorities to global health and many efforts have been made to re-formulate drugs that are highly lipophilic and have high variations in their oral bioavailability. One example of such drug is clofazimine, which has been recently identified as a potential new drug to treat cryptosporidiosis, the second leading cause of diarrhea in infants.1 Design of formulations for fast acting treatment of cryptosporidiosis with superior oral bioavailability to the commercially available clofazimine (Lamprene®) is therefore necessary and recent studies have demonstrated that flash-nanoprecipitated clofazimine nanoparticles could provide faster kinetics of drug release compared to Lamprene®.2,3 We herein investigate the solubilisation behaviours of clofazimine nanoparticles, taking into account intestinal digestion to more closely mimic the in vivo setting by tracking the evolution of diffraction peaks from crystalline drugs using the SAXS/WAXS beamline.4 The effects of fat in milk and infant formula on the solubilisation of clofazimine were also studied to better understand potential food effects in paediatric populations. Our results confirmed that clofazimine exhibits a fat-dependent solubilisation and that the solubilisation of drug from flash-nanoprecipitated clofazimine nanoparticles is faster than Lamprene®, which is highly desirable for treating Cryptosporidium infections in the small intestine.

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