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## Targeted delivery of adapalene to hair follicles for treatment of acne

Bozena "Bo" B Michniak-Kohn Ernest Mario School of Pharmacy, USA

A platform technology has been developed based on amphiphilic biocompatible ABA triblock copolymers that self-assemble to form polymeric nanospheres (TyroSpheres) and can be used as a carrier system for enhancing topical delivery of lipophilic actives and their stability in the formulation. Our goal was to investigate the applicability of TyroSpheres for follicular drug delivery and develop an aqueous-based gel formulation of drug-TyroSpheres for the treatment of acne. Our model anti-acne drug was adapalene, a third generation retinoid with a log P of 8.2. Adapalene-TyroSphere formulations were characterized for particle size, binding efficiency, drug loading, drug release, sebum partitioning, crystallinity and follicular delivery. Gel formulations of adapalene-TyroSpheres were also prepared using different thickening agents and analyzed for content uniformity, rheometry, particle agglomeration and skin irritation. A preclinical acne animal model was employed to test the efficacy of the adapalene treatment via TyroSpheres and compare it with the commercial product. Using TyroSpheres we were able to develop an alcohol-free aqueous-based formulation of adapalene, which is potentially less irritant than the commercial product (Differin\* gel). Small particle size in addition to a good partitioning of adapalene in human sebum contributed to the targeted delivery of adapalene-TyroSpheres to the pilosebaceous unit, where acne originates.

michniak@biology.rutgers.ed