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Polyamidosaccharides: bioactive polysaccharide mimetics overcome batch heterogeneity and contamination obstacles of natural extraction processes

Boston University - Madeline Loffredo, Mark Grinstaff

www.grinstaff.org

PRODUCT/SERVICE BACKGROUND INFORMATION

Polysaccharides exhibit an abundance of mechanical and therapeutic properties aiding in their application in cosmetic products. In addition to their non-toxic and biodegradable nature, they often act as stabilizers, emulsifiers, and viscosity modulators. Many also demonstrate immune-modulatory, antioxidant, and water retention activities. However, extraction from natural sources leads to heterogeneity and impurities resulting in negative side effects. Current methods to obtain fully synthetic polysaccharides are arduous and low-yielding, lending to a need for the development of polysaccharide mimetics with controlled molecular weights, selective functionalization, and retained bioactivity.

WHAT IS THE COMPANY INTRODUCING TO THE MARKET/INDUSTRY?

We describe the synthesis of polyamidosaccharides (PAS) via an anionic ring opening polymerization of a β-lactam. Specifically, we describe the development hyaluronic acid (HA) mimicking fully-carbohydrate based glycopolymers, and regioselectively functionalized and enantiopure 3,6-di-sulfated PAS. Polymers were assessed for bioactivity relative to native HA and heparin using biolayer interferometry, cell proliferation, confocal microscopy, aPTT/PT, enzymatic activity assays, and *in vivo* mouse models. These mimetics offer insight to the structure-function activity of polysaccharides and offer a potential alternative avenue for synthetic polysaccharides in cosmetics.

HOW WILL THIS NEW PRODUCT/SERVICE IMPACT THE INDUSTRY (BENEFITS)?

Polyamidosaccharides offer an efficient and readily functionalizable alternative to native polysaccharides where the described synthetic pathways overcome batch heterogeneity and evade the lengthy glycosylation processes of synthetic polysaccharides while retaining relevant bioactivity. While this work is not currently under-development for industrial applications [yet], I will be graduating in Spring 2027 and am excited and hopeful to expand my knowledge in materials science and chemistry to the field of cosmetics.