Slow-Release HPV Vaccine Implants Prepared by Melt-Extrusion

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Biopharmaceuticals are the main growth area in pharmaceutical research and development and, most often, proteins are the active pharmaceutical ingredient. Recombinant protein production can be inexpensively scaled to multi-kilogram scales with the rapidly improving molecular biotechnology field. One technological hurdle, however, is the formulation of functional proteins into therapeutic reservoirs, also known as depots. Solvent based processes lose significant portions of the therapeutic protein (up to 70%) and proteins may lose potency due to processing conditions. This talk will describe melt-processing of virus-like particles engineered as HPV vaccines. Melt processing is exceptional scalable, with commercial extruders reaching throughputs of 1000 kg h^{-1} and 100% of the active protein is encapsulated. Melt processing is thought to be possible because of the reduced hydration state in the melt, thus eliminating the driving force to form amorphous protein aggregates. The primary focus of this seminar will be a discussion of virus like nanoparticles (VLPs) derived from bacteriophage Qβ. Qβ is a combinatorial vaccine platform that has seen success in vaccine development for influenza, HIV, and hypertension. Melt processing conditions, physical models of processing, and biological data for HPV vaccination will be described in which Qβ is processed into slow-release depot delivery formulations.